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ABSTRACT

Self-teaching machines housed in trailer-classrooms were used to help 400 high school students improve their reading skills. The students, who were one or more years below grade level in reading skills at the start of the project, made positive gains in vocabulary and comprehension; progress was from two to six times that which was expected based on previous achievement. Gains were measured by the Gates-MacGinitie Reading Test. The project used 32 TV-like teaching machines housed in two mobile units servicing four schools. The objectives were to raise reading levels in comprehension and vocabulary by one year in 80 hours of instruction. Although students operated the machines and tested their own progress by themselves, a certified reading teacher and aide were available for assistance. It was recommended that the project be continued, that only the comprehension section of the Gates-MacGinitie test be used for evaluating gains and that a controlled study be set up to investigate the effects of rewards on student achievement. (Author/DI)

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Minneapolis Public Schools

Evaluation of the Mobile Learning Centers in Minneapolis Secondary Schools 1970-1971

Sara Page Clark, Research Coordinator

This project was supported by Title I ESEA, Title III NDEA and local funds

Ideas expressed in this report do not necessarily reflect the official position of the Minneapolis Public School Administration nor the Minneapolis School Board.

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January 1972

Report No. C-70-41

Research and Evaluation Department
Educational Services Division

Evaluation of the
Mobile Learning Centers
in Minneapolis Secondary Schools
1970 - 1971

Summary

	See Page
Self-teaching machines housed in trailer-classrooms were used to help 400 Minneapolis secondary school students improve their reading skills during the 1970-71 school year.	
The students, who were one or more years below grade level in reading skills at the start of the project, made positive and definite gains in vocabulary and comprehension. In fact, their rate of progress was from two to six times that which normally would have been expected, based on their previous achievement. Gains were measured by the Gates-MacGinitie Reading Test.	16, 17
The project, called Mobile Learning Centers, featured the use of TV-like teaching machines and educational materials developed by Dorsett Educational Systems. The machines -- 32 in all -- were housed in two large trailers that could be moved from school to school.	9-11
During 1970-71, one trailer was stationed at Lincoln Junior High School first semester and at North High School second semester. The other trailer remained at Central High School for the entire year, although students from Bryant Junior High used it, too. All four schools serviced are located in Minneapolis Schools Title I Target Areas.	12, 13
Objectives of the project were to raise the students' reading levels in comprehension and vocabulary by one year in 80 hours of instruction. The major emphasis was on helping students get meaning from the printed page.	9
Although students operated the machines and tested their own progress at the end of each lesson by themselves, assistance was available from the certified reading teacher and the aide who staffed each trailer.	9-11
Several recommendations, including continuation of the project, were made.	19

Financial support for this project came from Title I, ESEA, Title III NDEA, and local sources.

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January 1972

Research and Evaluation Department
Educational Services Division

Table of Contents

	Page
The City of Minneapolis	1
The Minneapolis Public Schools	4
History of Project	7
Program Description	9
Schools and Students Involved	12
Budget	14
Tests Used	15
Results	16
Discussion	18
Recommendations	19

List of Tables

Table No. 1	Grade Equivalent Gains Distributions, Gates-MacGinitie Reading Test, Level D, Vocabulary	20
Table No. 2	Grade Equivalent Gains Distributions, Gates-MacGinitie Reading Test, Level E, Vocabulary	21

About this report . . . . . .

All evaluation reports prepared by the Research and Evaluation Department of the Minneapolis Public Schools follow the procedures and format described in Preparing Evaluation Reports, A Guide for Authors, U. S. Department of Health, Education and Welfare.

Readers who are familiar with these Evaluation Reports may wish to skip the first two sections describing the City of Minneapolis and the Minneapolis Public Schools since these descriptions are standard for all reports.

The City of Minneapolis

The program described in this report was conducted in the Minneapolis Public Schools. Minneapolis is a city of 434,400 people located on the Mississippi River in the southeastern part of Minnesota. With its somewhat smaller twin city, St. Paul, it is the center of a seven county metropolitan area of over 1,874,000, the largest population center between Chicago and the Pacific Coast. As such it serves as the hub for the entire Upper Midwest region of the country.

The city, and its surrounding area, long has been noted for the high quality of its labor force. The unemployment rate in Minneapolis is lower than in other major cities, possibly due to the variety and density of industry in the city as well as to the high level capability of its work force. The unemployment rate in May of 1971 was 4.7%, compared with a 6.2% national rate for the same month. As the economic center of a prosperous region rich in such natural resources as forests, minerals, water power and productive agricultural land, Minneapolis attracts commerce and workers from throughout the Upper Midwest region. Many residents are drawn from the neighboring states of Iowa, Wisconsin, Nebraska and the Dakotas as well as from the farming areas and the Iron Range region of outstate Minnesota.

More Minneapolitans -- three out of 10 -- work in clerical and sales jobs than in any other occupation, reflecting the city's position as a major wholesale-retail center and a center for banking, finance and insurance. Almost as many (27%) are employed as craftsmen, foremen and operatives, and one out of five members of the work force are professionals, technicians, managers, and officials. Fewer than one out of five (17%) workers are employed in laboring and service occupations.

Minneapolis city government is the council-dominated type. Its mayor, elected for a two year term, has limited powers. Its elected city council operates by committee and engages in administrative as well as legislative action.

Minneapolis is not a crowded city. While increasing industrial development has occupied more and more land, the city's population has declined steadily from a peak of 522,000 in 1950. The city limits have not been changed since 1927. Most homes are sturdy, single family dwellings built to withstand severe winters. Row homes are practically nonexistant even in low income areas. In 1970, 48% of the housing units in Minneapolis were owner-occupied.

Most Minneapolitans are native born Americans, but about 35,000 (7%) are foreign born. Swedes, Norwegians, Germans, and Canadians comprise most of the foreign born population.

Relatively few nonwhite citizens live in Minneapolis although their numbers are increasing. In 1960 only three percent of the population was nonwhite. The 1970 census figures indicate that the nonwhite population has more than doubled (6.4%) in the intervening 10 years. About 70% of the nonwhites are Black. Most of the remaining nonwhite population is American Indian, mainly Chippewa and Sioux. Only a small number of residents from Spanish-speaking or Oriental origins live in the city. In 1970 nonwhite residents made up 6.4% of the city's population but accounted for 15% of the children in the city's elementary schools.

Minneapolis has not yet reached the stage of many other large cities in terms of the level of social problems. It has been relatively untouched by racial disorders or by student unrest. Crime rates are below national averages. Continuing concern over law and order, however, is still evidenced

by the election in 1969 and the re-election in June 1971 of Mayor Charles Stenvig, a former police detective.

One's first impression is that Minneapolis doesn't really have serious problems of blight and decay. But the signs of trouble are evident to one who looks beyond the parks and lakes and tree-lined streets. As with many other large cities, the problems are focused in the core city and are related to increasing concentrations there of the poor, many of them nonwhites, and of the elderly. For example, nine out of 10 Blacks in Minneapolis live in just one-tenth of the city's area. While Minneapolis contains 11.4% of the state's population, it supports 27% of the state's AFDC families. In addition, more than one out of every four school children in Minneapolis now is living in a low income (Title I criteria) home.

There has been a steady migration to the city by American Indians from the reservations and by poor whites from the small towns and rural areas of Minnesota. They come to the "promised land" of Minneapolis looking for a job and a better way of life. Some make it; many do not. In 1967 the city supported one out of 10 of the state's American Indians who were on relief; in 1969 the city supported three out of 10. The American Indian population is generally confined to the same small geographic areas where the Blacks live. Estimates of the Indian unemployment rate vary, but range as high as 60%. These same areas of the city have the lowest median incomes in the city and the highest concentrations of dilapidated housing, welfare cases, and juvenile delinquency.

The elderly also are concentrated in the central city. In 1970, 15% of its population was over age 65. The elderly, like the 18 to 24 year old young adults, live near the central city because of the availability

of less expensive housing in multiple-unit dwellings. Younger families have continued to migrate toward the outer edges of the city and surrounding suburban areas.

The Minneapolis Schools

About 78,700 children go to school in Minneapolis. Most of them, about 64,200, attend one of the city's 99 public schools; 14,500 attend parochial or private schools.

The Minneapolis Public Schools, headed by Dr. John B. Davis, Jr., who became Superintendent in 1967, consists of 69 elementary schools (kindergarten-6th grade), 15 junior high schools (grades 7-9), nine high schools (grades 10-12), two junior-senior high schools, and five special schools. Over 3,700 certificated personnel are employed.

Control of the public school system ultimately rests with the seven-member School Board. These nonsalaried officials are elected by popular vote for staggered six year terms. The Superintendent serves as the Board's executive officer and professional adviser, and is selected by the Board.

The system's annual operating general fund budget in 1971 was $72,784,887 up from $62,385,985 in 1970 and $56,081,514 in 1969. Per pupil costs were $715 in 1970. The range of per pupil costs in the state for 1970 was from $387.00 to $908.00. The range of per pupil expenditures for school districts in the seven-county metropolitan area was $536 to $820 with a mean expenditure of $645.[1] Almost 40 cents of each local property tax dollar goes for school district levies. The School Board is

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[1] Per pupil cost is the adjusted maintenance cost from state and local funds and old federal programs, exclusive of transportation, per pupil unit in average daily attendance for the 1968-69 school year. Source of these figures is Minnesota Education Association Circular 7071-C2 Basic Financial Data of Minnesota Public School Districts, February, 1971.

a separate governmental agency which levies its own taxes and sells its own bonds. Minneapolis also received federal funds totaling 4.2 million dollars in 1970-71 from many different federal aid programs. The Elementary and Secondary Education Act provided about 2.9 million dollars of which 2.5 million dollars was from Title I funds.

One of the Superintendent's goals has been to achieve greater communication among the system's schools through decentralization. Consequently two "pyramids" or groups of geographically related schools have been formed. First to be formed, in 1967, was the North Pyramid, consisting of North High School and the elementary and junior high schools which feed into it. In 1969 the South-Central Pyramid was formed around South and Central High Schools. Each pyramid has an area assistant superintendent as well as advisory groups of principals, teachers, and parents. The goals of the pyramid structure are to effect greater communication among schools and between schools and the community, to develop collaborative and cooperative programs, and to share particular facilities and competencies of teachers.

In 1970-71 there were 22 elementary schools, four junior highs, three senior highs, and five parochial schools serving children in areas eligible for programs funded under Title I of the Elementary and Secondary Education Act (ESEA). The federal criteria for selecting these schools are based on economic factors, in particular the number of families receiving AFDC or having incomes under $2,000. About 20,000 children attend these public and parochial schools. Of that number, about one-third of the children have nonwhite backgrounds, and one-third are defined by the State Department of Education as educationally disadvantaged, i.e. one or more grade levels behind in basic skills such as reading and

arithemetic. Federal programs are concentrated on the educationnaly disadvantaged group.

Based on sight counts on October 20, 1970 the percentage of Black pupils for the school district was 9.9%. Six years before the proportion was 5.4%. American Indian children currently comprise 3.7% of the school population, more than double the proportion of six years ago. The proportion of minority children in the various elementary schools generally reflects the prevailing housing pattern found in each school area. Although some nonwhite pupils are enrolled in every elementary school, nonwhite pupils are concentrated in two relatively small areas of the city. Of the 69 elementary schools, 11 have more than 30% nonwhite enrollment and five of these have over 50%. There are no all-black or all-white schools. Thirty-three elementary schools have nonwhite enrollments of less than 5%.

The proportion of school age children in AFDC homes has almost doubled from approximately 12% in 1962 to 23% in 1971.

Turnover rate is the percent of students that come in new to the school or leave the school at some time during the school year (using the September enrollment as a base figure). While the median turnover rate for all the city schools in 1969-70 was about 22%, this figure varied widely according to location. Target Area schools generally experienced a much higher turnover rate; in fact only two of the Target Area schools had turnover rates less than the city median. Compared with the city, the median for the Target Area schools was almost twice as large (41%).

Mobile Learning Centers

History of Project

In 1970 the Minneapolis Schools, recognizing the need for an innovative approach to the reading difficulties of a number of secondary students in Target Area schools, allocated funds for teaching machines. A group of teachers and administrators from the school system were impressed with the programs and machines presented by the Dorsett Educational Systems at the Aerospace Educational Technology meetings held in Washington, D.C., in January 1970. After further investigation and discussion the Mobile Learning Centers project, incorporating the Dorsett machines and programs, was initiated when monies from NDEA Title III, and ESEA Title I -- as well as the local funds -- became available. Two large trailers were bought to serve as classrooms to provide mobility for the project. The use of these Mobile Learning Centers was restricted to secondary schools in the Title I schools because of the federal funds which helped support the project.

The Area Assistant Superintendents for the North and South-Central Pyramids, after discussing the Centers' potentialities with the Administrator of the Basic Skill Centers and principals in their areas, thought that the new program would be of greatest use at Lincoln Junior High and Central and North High Schools in 1970-71. The Administrator

of the Basic Skill Centers then met with members of the staffs of the schools involved to discuss the implementation of the program and procedures for selection of students to be enrolled.

Since the program was new to the schools some problems in assigning students to the trailers were encountered in the fall of 1970, but they were soon solved. No other problems occurred in implementing the program.

Activities which introduced the project and helped gain acceptance for it included the following: The teachers at the Mobile Learning Centers were introduced to the staffs at their base schools at the beginning of the school year. Open houses at the trailers were held when similar events were sponsored by the P.T.A.'s at the respective schools. Presentations concerning the project were made to a majority of Minneapolis secondary reading teachers at inservice meetings during the year. The project also received publicity in the School Bulletin.

1970-71

Mobile Learning Centers

Program Description

A developmental reading program, using Dorsett programs and teaching machines, was used to remediate reading deficiencies of about 400 inner-city junior and senior high school students during the 1970-71 school year. The major objective of the project was to raise the students' reading levels in comprehension and vocabulary by one year in 80 hours of instruction.

Two large trailers, about 60' by 14', were purchased with the aid of NDEA, Title III, money. Each trailer contained 16 Dorsett teaching machines which were in semi-private carrels. About 200 students could be served per school day in the two trailers.

The machines look something like TV sets. The lessons are projected on the screens from film strips which are sound-synchronized with records. Headphones are available for individual listening. The machines are simple to operate so that the students can change the records and film strips themselves. The students respond to questions in the lesson by pushing buttons which allow multiple-choice or forced-choice options. When the correct response is given, the machine proceeds to the next frame in the program. The student is also furnished with a Reading Panel containing the story to which he can refer at any time during the lesson.

The panel gives the student a chance to reread the material at his own rate of speed and gives him another chance to assimilate the material before attempting to respond to questions on the machine.

At the end of each filmstrip a progress check was given which consisted of up to 10 multiple choice questions. In this way the student's understanding of each lesson could be measured as soon as he had completed the lesson. Since the test was scored immediately, the teacher could either provide verbal reinforcement and encouragement for good work or, if the student had scored less than 80%, help him find his errors before he repeated the lesson.

The reading course included programs in Vocabulary and Comprehension. The curriculum guide provided with the materials states that in the Reading Comprehension programs: "The questions are designed to develop reading skills such as recalling details and facts, understanding main ideas and sequence of events, drawing conclusions, and finding and understanding key sentences and words." The 61 programs in this series were arranged in five categories according to grade level ranging from first through eighth grade. The 80 Vocabulary programs were also arranged in five categories, beginning with a series which introduced 800 sight words in sentences and continuing through eighth grade words.

The program was flexible. Students were tested when they entered and then assigned to their appropriate beginning levels. They could work at their own rate but generally were limited to two programs a day. Some students finished the program earlier than others. First semester students were given gift certificates from a large department

store at the end of the term. They were awarded five cents for each program completed and a three dollar bonus if they had made a grade equivalent gain of one or more years on the Gates-MacGinitie tests used for evaluating the project.

Each trailer was staffed with a certified reading teacher and an aide who had received one and one-half days inservice training from Dorsett Educational Systems.

Schools and Students Involved

The trailers used in the project are mobile and can be moved from one location to another. One of them remained at Central High School for the entire year. The other was at Lincoln Junior High for the first semester and at North High for the second term. The students from Lincoln attended on a semester basis while all others were on a quarter system. A number of students from Bryant Junior High School also attended the Central trailer.

All of the schools where the program was presented were inner-city Target Area schools. According to the Title I Index, the percent of the student enrollment at the participating schools who came from low income families ranged from 68% at Bryant to 98% at Lincoln. The minority enrollment in these schools ranged from 31% at North High to 71% at Lincoln Junior High. According to the standardized reading tests given city-wide in the eighth grade 34% of the children from Bryant and 58% of those at Lincoln were one or more years below grade level. The eleventh grade tests showed 49% of the students at Central and 43% of those at North to be one or more years below grade level in reading.

The students selected for participation in this program, on the basis of past tests and teacher recommendations, were all chosen from the group which was one or more years below grade level in reading.

The tenth grade comprised 46% of the enrollment but they had a higher drop-out level than any other grade. Only 47% of the tenth graders originally enrolled were present for both the pre- and post-tests compared with 83% of the eighth and ninth graders. Part of this dropping out of the tenth graders was undoubtedly due to some confusion in the selection procedure at Central High School at the very beginning of the program.

At the senior high level, 63% of the students were boys and 37% were girls. These figures were reversed at the junior high level.

Budget

Funds totaling $77,696.94 for the Mobile Learning Centers for the school year 1970-71 were obtained from three sources:

Title I, ESEA	58%
Local	27%
Title III, NDEA	15%

The funds were administered by the Administrator of the Basic Skill Centers. The program cost $5.85 per 50-minute pupil period in this first year of operation. In a second year this figure would be reduced since about one-half of the total money spent was for "start up" costs such as the trailers, furniture, and Dorsett machines and programs. An average cost per pupil would be meaningless since some students were enrolled for a quarter and some for a semester and the attendance ranged from 1 to 99 days present.

The funds were spent as follows:

Account	Expenditure	% of Total
Salaries	$30,073.14	38.7
Supplies	13,693.24	17.6
Equipment	29,393.46	37.8
Furniture	1,236.00	1.6
Utilities	1,237.86	1.6
Moving & Installations	2,063.24	2.7
Total	$77,696.94	100.00%

Tests Used

The Gates-MacGinitie Reading Tests were used for assessing gains which the students made. Level D, designed for grades 4-6 was used at Lincoln Junior High, and Level E, intended for grades 7-9 was used at the other schools. These tests were selected because they reflected the level of the Dorsett programs, not the actual grade levels of the students enrolled. Both the Vocabulary and Comprehension sections of the tests were used although the Vocabulary test sampled a somewhat different group of words from that taught in the Dorsett course. According to the test publishers, the Comprehension test "measures the student's ability to read complete prose passages with understanding." Different forms of the tests from those used in the city-wide testing program were administered to limit practice effects.

Results

Rate of growth in reading as measured by the Gates-MacGinitie Vocabulary and Comprehension tests was used to evaluate the success of the program. These students, who were over a year below grade level at the beginning of the project, had been gaining at a rate of less than a month for every month they had been in school. However, in about .25 of a school year, the Form D students (N=71) made grade equivalent gains of +1.1 in Vocabulary and +1.6 in Comprehension. In this same time those who were tested with Form E (N=169) made grade equivalent gains of +.5 in Vocabulary and +1.0 in Comprehension. In other words, gains were from two to six times what would have been expected on a month for a month basis, depending on the section and test used for determining the rate of progress.

In about forty hours of instruction, or one-fourth of the school year, gains of six months or more were made by 66% of the Form D students in Vocabulary and 84% in Comprehension. Of the Form E students, gains of one or more years made by 48% of the students in Vocabulary and 61% in Comprehension. These gains should be viewed with respect to the major objective of the project which was to raise the students' reading levels in Comprehension and Vocabulary by one year

in 80 hours of instruction.

The junior high school students progressed at a greater rate than did the senior high students. The junior high pupils completed more programs than did the senior high students, but the difference was not significant.

Discussion

Positive and definite gains were made by the Mobile Learning Center students in both Vocabulary and Comprehension. The greater gains shown by the junior high students who were tested with Form D of the Gates-MacGinitie test may have been inflated by the monetary incentive which was offered them at the beginning of the year. Unfortunately, the students who did not receive financial rewards were all either senior high students or were tested with the higher level, Form E, of the test so the effect of the incentive could not be evaluated.

The tests selected for this assessment were different from those used elsewhere in the evaluation of the Dorsett Education System which were criticized for "teaching to the test." In fact, the teachers in the project said that the Vocabulary sections sampled a different group of words from those specifically taught in the Dorsett programs. Since a major objective of this program was to help the student get meaning from the printed page the greater gains made in Comprehension showed the attainment of this goal.

1970-71

Recommendations

1. The Mobile Learning Centers project should be continued since it proved to be quite effective in achieving its stated objective in 1970-71.

2. Use only the Comprehension section of the Gates-MacGinitie tests. It is sufficient for evaluating the efficacy of the program and will minimize the time taken for testing from a one-quarter course.

3. Set up a controlled study to investigate the effects of monetary rewards on student achievement.

Table 1

Mobile Learning Centers
Grade Equivalent Gains Distributions
Gates-MacGinitie Reading Test, Level D[1]
1970-71

Grade Equivalent Gains	Vocabulary N	Vocabulary Percent	Vocabulary Cum Percent	Comprehension N	Comprehension Percent	Comprehension Cum Percent
+4.6 or More	1	1.4	1	3	4.2	4
+4.1 to +4.5	1	1.4	3			
+3.6 to +4.0				6	8.5	13
+3.1 to +3.5	6	8.5	11	5	7.0	20
+2.6 to +3.0	5	7.0	18	4	5.6	25
+2.1 to +2.5	5	7.0	25	10	14.1	39
+1.6 to +2.0	7	9.9	35	10	14.1	54
+1.1 to +1.5	13	18.3	54	13	18.3	72
+1.0	3	4.2	58	1	1.4	73
+ .9				4	5.6	79
+ .8	2	2.8	61			
+ .7	3	4.2	65	2	2.8	82
+ .6	1	1.4	66	2	2.8	85
+ .5	1	1.4	68	2	2.8	87
+ .4	4	5.6	73			
+ .3	2	2.8	76	2	2.8	90
+ .2	2	2.8	79	1	1.4	92
+ .1	1	1.4	80	1	1.4	93
0	5	7.0	87	2	2.8	96
- .1 to - .5	3	4.2	92	2	2.8	99
- .6 to -1.0	3	4.2	96	1	1.4	100
-1.1 to -1.5	2	2.8	99			
-1.6 to -2.0	1	1.4	100			
	71	100.0%		71	100.0%	
	Median Gain: +1.1			Median Gain: +1.6		

Average Attendance: 44.25 days or .25 school year

[1] Students from Lincoln Junior High School

N.B. Medians were derived from ungrouped data

Table 2

Mobile Learning Centers
Grade Equivalent Gains Distributions
Gates-MacGinitie Reading Test, Level E[1]
1970-71

Grade Equivalent Gains	Vocabulary			Comprehension		
	N	Percent	Cum. Percent	N	Percent	Cum. Percent
+5.6 to +6.0				1	.6	1
+5.1 to +5.5	2	1.2	1	1	.6	1
+4.6 to +5.0	2	1.2	2	1	.6	2
+4.1 to +4.5	2	1.2	4	3	1.8	4
+3.6 to +4.0	2	1.2	5	3	1.8	5
+3.1 to +3.5	3	1.8	7	7	4.2	10
+2.6 to +3.0	5	3.1	10	12	7.1	17
+2.1 to +2.5	8	4.9	15	12	7.1	24
+1.6 to +2.0	20	12.2	27	22	13.0	37
+1.1 to +1.5	18	11.0	38	18	10.7	47
+1.0	2	1.2	39	7	4.1	52
+ .9	7	4.3	43	5	3.0	54
+ .8	4	2.4	46	5	3.0	57
+ .7	1	.6	46	5	3.0	60
+ .6	2	1.2	48	1	.6	61
+ .5	6	3.7	51	5	3.0	64
+ .4	9	5.5	57	3	1.8	66
+ .3	14	8.5	65	2	1.2	67
+ .2	5	3.1	68	6	3.6	70
+ .1				2	1.2	72
0	15	9.2	77	10	5.9	78
- .1 to - .5	9	5.5	83	15	8.9	86
- .6 to -1.0	13	7.9	91	14	8.3	95
-1.1 to -1.5	5	3.1	94	3	1.8	97
-1.6 to -2.0	8	4.9	99	4	2.4	99
-2.1 to -2.5	1	.6	99			
-2.6 to -3.0	1	.6	100	2	1.2	100
	164	100.0		169	100.0	
	Median Gain + .5			Median Gain: +1.0		

Average Attendance: 40.65 days or .22 school year

[1] Students from Central and North High School and Bryant Junior High School

N.B. Medians were derived from ungrouped data.

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